

MATLAB Workshop: DIY Examples



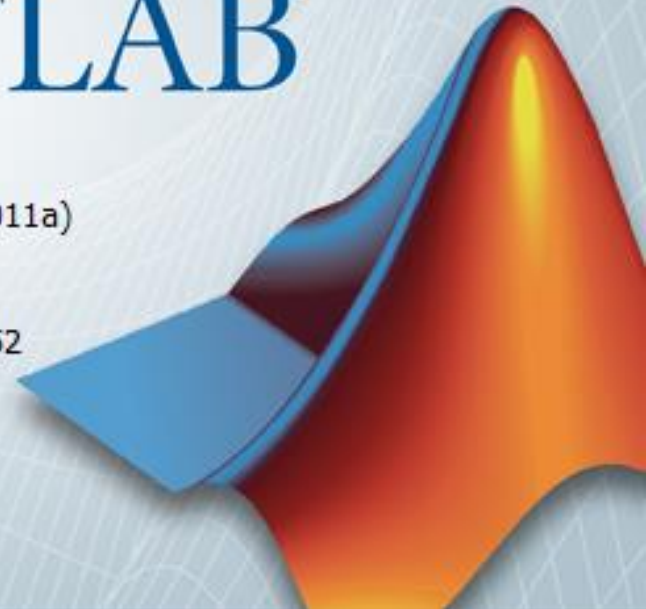
**Engineering
Peer Helper
Program**

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MATLAB®

Version 7.12.0.635 (R2011a)
64-bit (win64)
March 18, 2011
License Number: 161052



- What is MATLAB?
- Getting Started
- Review of Getting Started
- DIY Examples:
 - Gas Equation
 - Coin Toss Live Plot
 - Fibonacci numbers
 - Discovering π

Review: What is MATLAB?

MATLAB is...

- an “integrated development environment”
- used for:
 - exploring data on the fly
 - modeling systems (engines, maps, images, ...)
 - building research tools
- used by:
 - engineers
 - scientists
- more powerful than Excel
- but easier than programming in C

Review: Getting Started

The screenshot shows the MATLAB IDE interface with the following components highlighted:

- WORKING DIRECTORY:** Located in the top-left pane, it shows a file explorer view of the current directory, listing files like 'matlab', '.DS_Store', and 'battree'.
- EDITOR:** The central pane displays a MATLAB function file named 'ls'. It contains comments explaining the function's purpose and MATLAB-specific code for listing directories on different operating systems.
- WORKSPACE:** Located in the top-right pane, it shows a table of current variables in the workspace, with columns for 'Name' and 'Value'.
- COMMAND HISTORY:** Located in the bottom-right pane, it lists commands previously entered in the command window, such as 'dbcont', 'foo', 'cd', 'edit', 'mkdir', 'touch', and 'cd'.
- COMMAND WINDOW:** Located at the bottom, it shows the prompt 'fx >>' followed by the command 'plot('.

At the bottom of the window, the status bar indicates 'Start Ready' on the left and 'Ln 7 Col 20' on the right.

Review: Resources

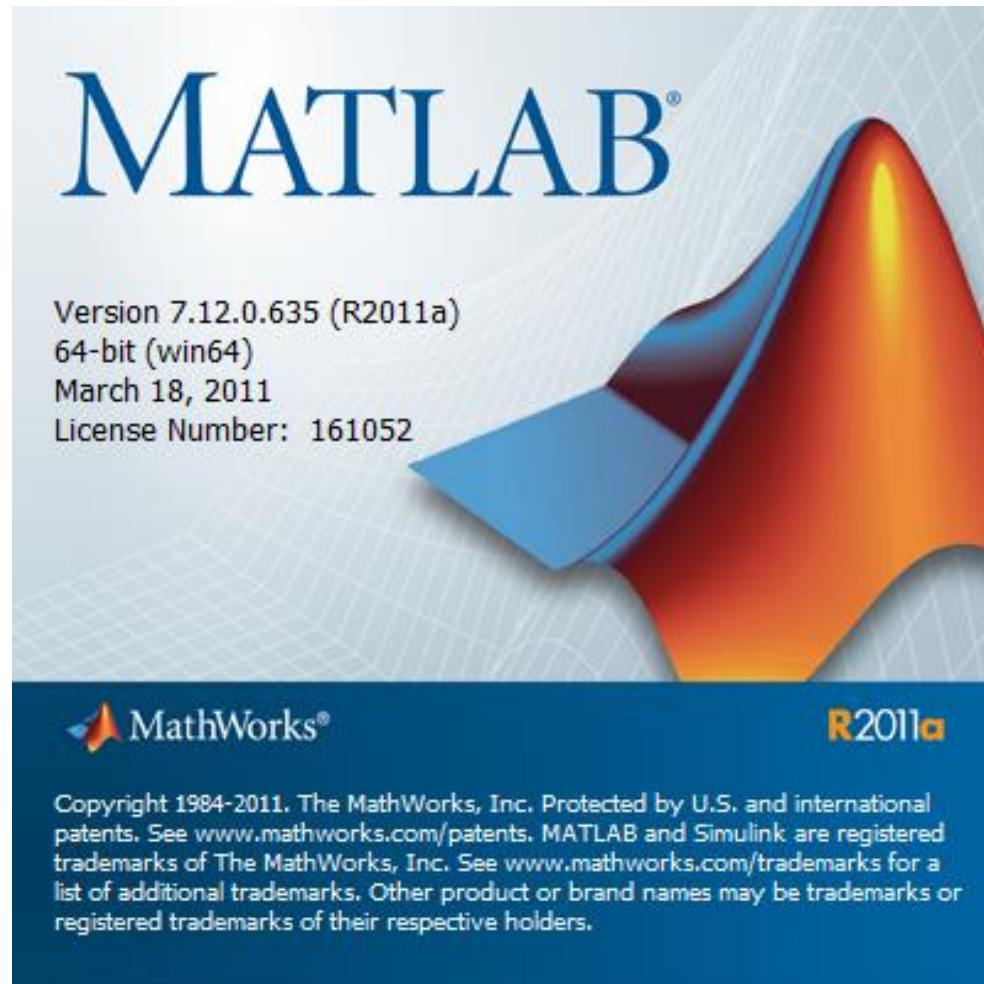
Getting Started

- Tutorial: [MathWorks Getting Started Guide](#)
- Basic Syntax: [Reference Card](#), [example .m files](#)
- Specific Tasks: Google “ (doing X) in MATLAB ”

Debugging

- “ help <function> ”
- Guide to [error messages](#)
- [StackOverflow](#)
- [Google](#)
- Peers, TAs, Profs

Review: Getting Started



Example: Gas Equation

An arbitrary sine function:

$$S = M \sin(2\pi t + \phi)$$

Values for M and t :

$$t = 0 \dots 5 \ (\Delta t = 0.01)$$

$$M = [1, 2, 4]$$

- For each M , and constant $\phi = \frac{\pi}{2}$, plot the value of $S(t)$.
Label axes appropriately.

Example: Coin Toss Live Plot

- Create a script which models 2000 coin tosses
- Plot the *running proportion* of heads for tosses $t = 1:2000$
- Edit the script so that 10 tosses are plotted at a time, with a small delay between each update

Some useful functions might be:

round, rand, mod, drawnow, pause

Example: Fibonacci Numbers

- Create a function to check if a number is a Fibonacci number
- Check the numbers `n=1:10000` and show the result graphically

Hint: How are you going to check if a number is a Fibonacci number?

Some useful functions might be:

`sqrt`, `round`, `if`, `else`

Example: Discovering π

Consider a unit circle in the 2D Cartesian plane with

$$x \in [-1, +1] \text{ and } y \in [-1, +1].$$

- Write a function to test if a coordinate pair x, y is in the unit circle
- Randomly select N points in this space and use the ratio:

$$\frac{\#(x, y) \in \oplus}{\#(x, y) \in \boxplus}$$

to estimate π .

- How does this estimate change with N ?

Hint: What is the equation of the unit circle?

Hint: What is the area ratio between a unit circle and a unit square?

The examples in this tutorial were inspired by
[MATLAB for the Absolute Beginner](#)
by Arvind Ravichandran.